

Single Chip EUV, VUV and Deep UV Photodetector System with Integrated Amplifier, Phase I

Completed Technology Project (2016 - 2016)



Project Introduction

We here propose the development and fabrication of an integrated sensor device capable of detecting across a wide band of UV radiation, from extreme UV (1 to 50 nm) through vacuum UV (50 to 175 nm) and into deep UV (175 to 350 nm). The proposed sensor will comprise a photodiode, a Schottky diode, and an amplifier circuit fabricated in the same process flow and monolithically integrated on the same die. We will use silicon carbide as the semiconductor material, which will make the proposed work the first time an integrated silicon carbide sensor device is fabricated. The nascent semiconductor material, silicon carbide, has found widespread application in power electronics. However, its advantageous properties as an optoelectronic detector device in the UV range (transparency to visible light and very low dark current, both results of its very wide bandgap) have not been utilized widely. With the proposed work, we therefore aim to advance the state-of-the-art in silicon carbide technology. To realize the goals of the program, which are designing and fabricating a SiC VUV detector, a SiC DUV/EUV detector, a single SiC nMOSFET, an amplifier comprised of SiC nMOSFETs, and an integrated single chip photodetector and amplifier from these individual components, we propose a work plan including process development and optimization for SiC Schottky diodes (as the VUV detector) and SiC nMOSFETs, and process optimization for SiC photodiodes (the EUV/DUV detector). We will simultaneously develop and optimize the process to fabricate all these components on the same die with the required connections to obtain a monolithic SiC detector/amplifier circuit and thereby obtain a SiC sensor-on-a-chip.

Primary U.S. Work Locations and Key Partners

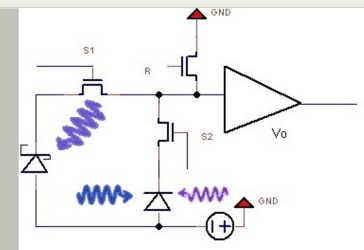
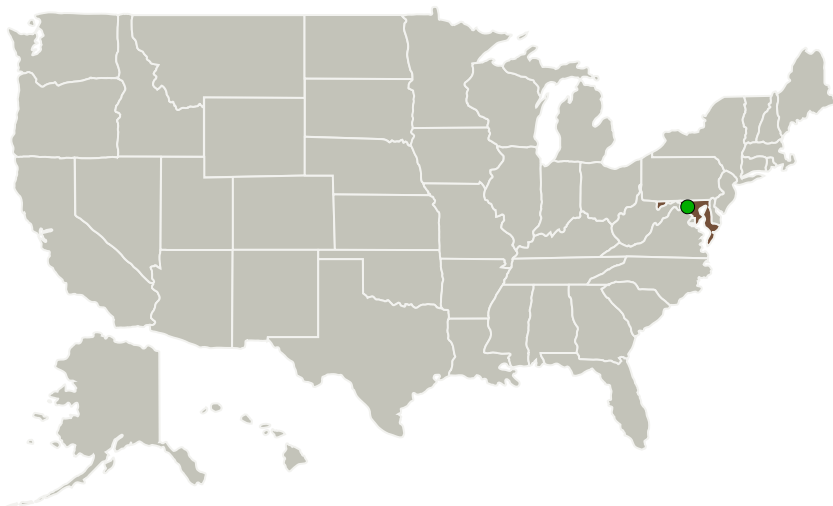


Illustration of EUV, VUV and Deep UV Detector System on a Single Chip

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Organizations Performing Work	Role	Type	Location
CoolCAD Electronics, LLC	Lead Organization	Industry	Takoma Park, Maryland
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations

Maryland

Project Transitions



June 2016: Project Start

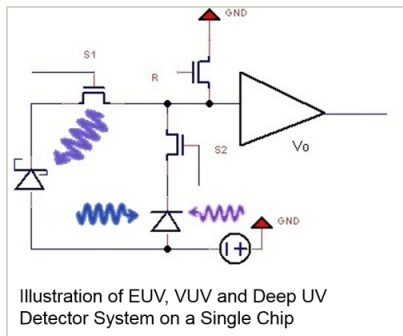


December 2016: Closed out

Closeout Documentation:

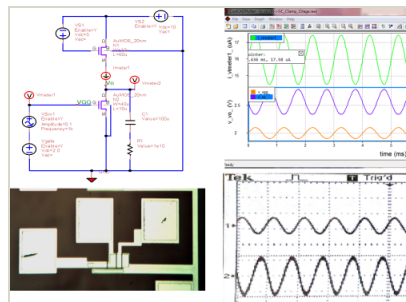
- Final Summary Chart(<https://techport.nasa.gov/file/140345>)

Images



Briefing Chart Image

Single Chip EUV, VUV and Deep UV Photodetector System with Integrated Amplifier, Phase I
(<https://techport.nasa.gov/image/126146>)



Final Summary Chart Image

Single Chip EUV, VUV and Deep UV Photodetector System with Integrated Amplifier, Phase I Project Image
(<https://techport.nasa.gov/image/128590>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

CoolCAD Electronics, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

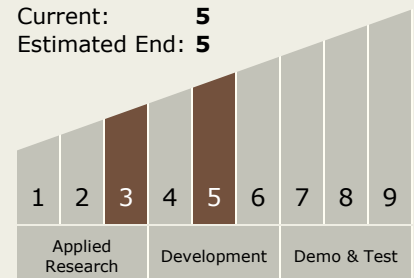
Carlos Torrez

Principal Investigator:

Akin Akturk

Technology Maturity (TRL)

Start: 3
Current: 5
Estimated End: 5



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Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.1 Detectors and Focal Planes

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System